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Animal Keepers' Forum

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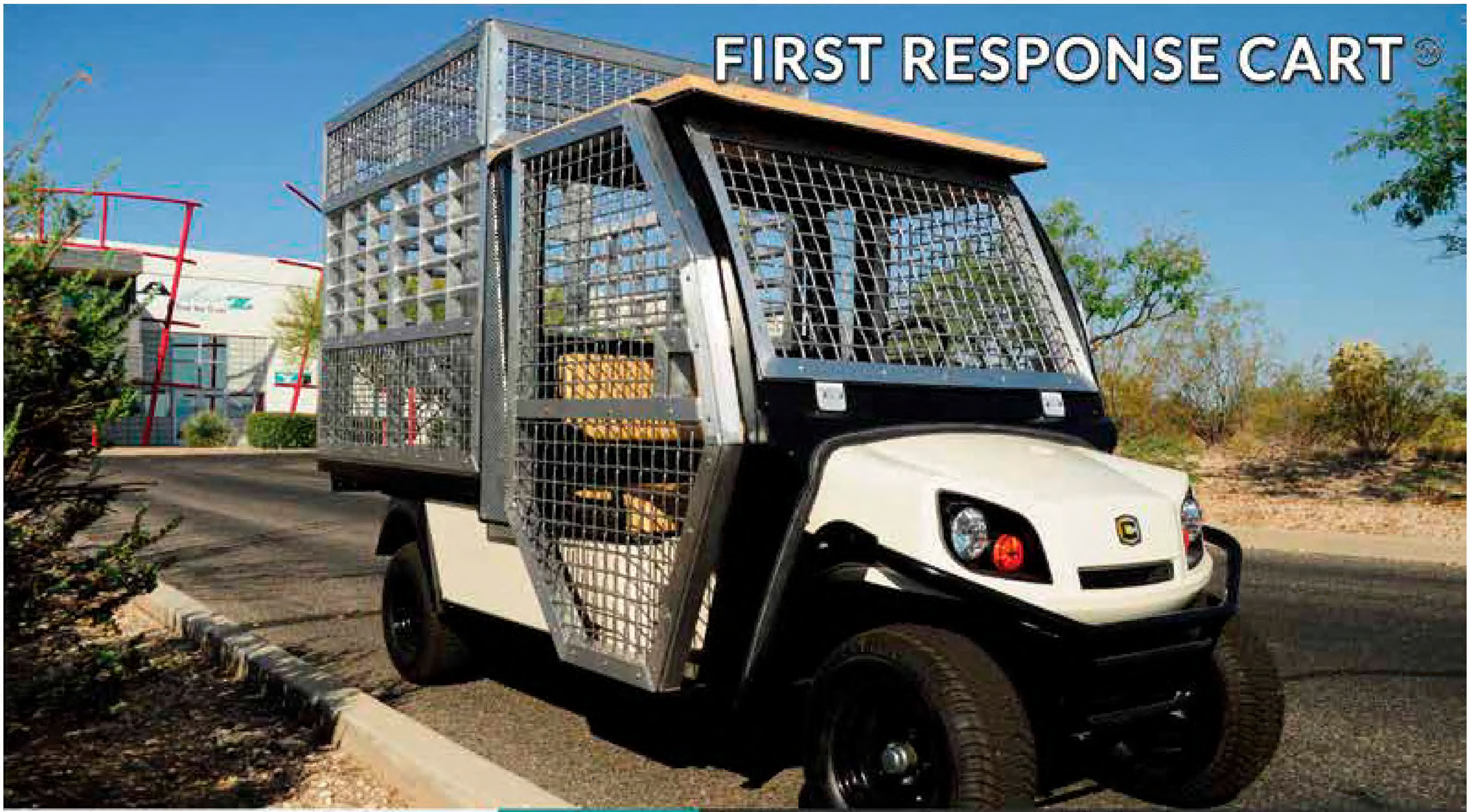

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The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

ABOUT THE COVER

October 1 marks the start of World Lemur Festival, a celebration throughout October to celebrate lemurs and raise awareness for lemur conservation. Lemurs are only found naturally on the Island of Madagascar, the fourth largest island in the world. Over 90% of Madagascar's biodiversity is endemic, found nowhere else. Lemurs are considered the most endangered group of mammals. Over 98% of the more than 100 species of lemurs are threatened with extinction and almost a third of those 100 plus species are classified as Critically Endangered, according to the IUCN's Red List. Blue-eyed Black Lemurs (*Eulemur flavifrons*), like McKinnon, are one of those Critically Endangered Species. There are less than 100 in the wilds of Madagascar and none of the Blue-eyed Black Lemurs occur in protected areas.

McKinnon is part of the Blue-eyed Black Lemur SSP and moved to Little Rock Zoo from Akron Zoo earlier this year and has been recommended to breed with resident male, Willie. This species exhibits sexual dichromatism. Only the males are black, the females are a reddish brown. True to their name, they all have blue eyes, a rare occurrence in the primate world!

Photo submitted by Karen Caster of the Little Rock Zoo.

Articles sent to *Animal Keepers' Forum* will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for *AKF*. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

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FROM THE PRESIDENT

It finally happened! After five years of planning, one year of delay, and tons of adjustments, the 2021 AAZK National Conference took place in Los Angeles! The Conference didn't look the way it normally does, but the Los Angeles Chapter of AAZK deserves a huge shout out for all of their effort in putting on the first hybrid Conference in the history of the Association. The dedicated members of this Chapter put in a tremendous amount of effort including about 10 hours of virtual meetings per week as they came down the home stretch! I wish that all of you could have seen the incredible set-up at this year's Conference because it was truly a sight to behold and none of it would have been possible without the tireless work put in by the Los Angeles Chapter members and the Conference volunteers. Whether it was setting up both virtual and in-person Zoo Day options, planning an integrated Icebreaker, or arranging for a diverse docket of presentations and Q&A sessions, the team from LA did a tremendous job and truly put on a once-in-a-lifetime (hopefully) experience.

The Conference didn't look the way it normally does, but the Los Angeles Chapter of AAZK deserves a huge shout out for all of their effort in putting on the first hybrid Conference in the history of the Association.

While on the topic of the diverse docket of presentations, I wanted to pass along thanks to all of the members of the AAZK Professional Development Team. Putting together a Conference program is a difficult task in the best-case scenario, but dealing with the trials and tribulations of unifying pre-uploaded presentations and posters with live Q&As and PCC's and panel discussions in a time when the membership was struggling with their own comfort level and accessibility to work in these realms was extraordinary. Thank you to all those who presented as well! Presenting at a Conference can be stressful as it is, but the added layer of the hybrid format made everyone's contributions especially important this year. And not to forget the Committees, Programs, Partners, Sponsors, and everyone who supported the 2021 AAZK National Conference; the success of this year would not have been possible without each and every one of you.

Lastly, I wanted to give thanks to the two outgoing members of our Board of Directors, Ellen Vossekuil and Abbie Doan. Working with you to lead this Association was a pleasure and I will miss having you involved with the Board. Please join me in welcoming our three new Board members: Russell Pharr, Joe Nappi, and Erika Defer. I look forward to serving alongside all of you.

Thank you again to everybody who played a role in the success of AAZK throughout the current pandemic and for working to put on an exceptional 2021 AAZK National Conference in Los Angeles! I hope to see many new and familiar faces next year in Toronto!

Regards,

Paul Brandenburger, AAZK President
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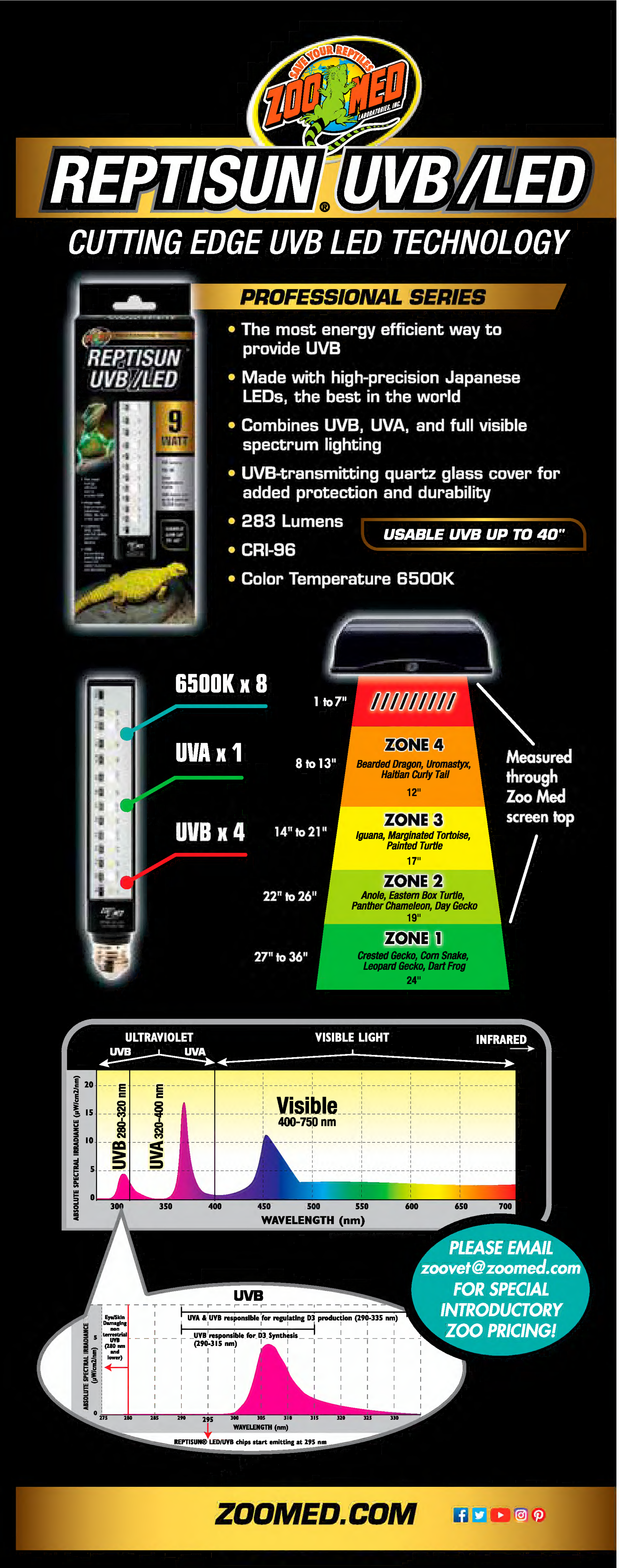

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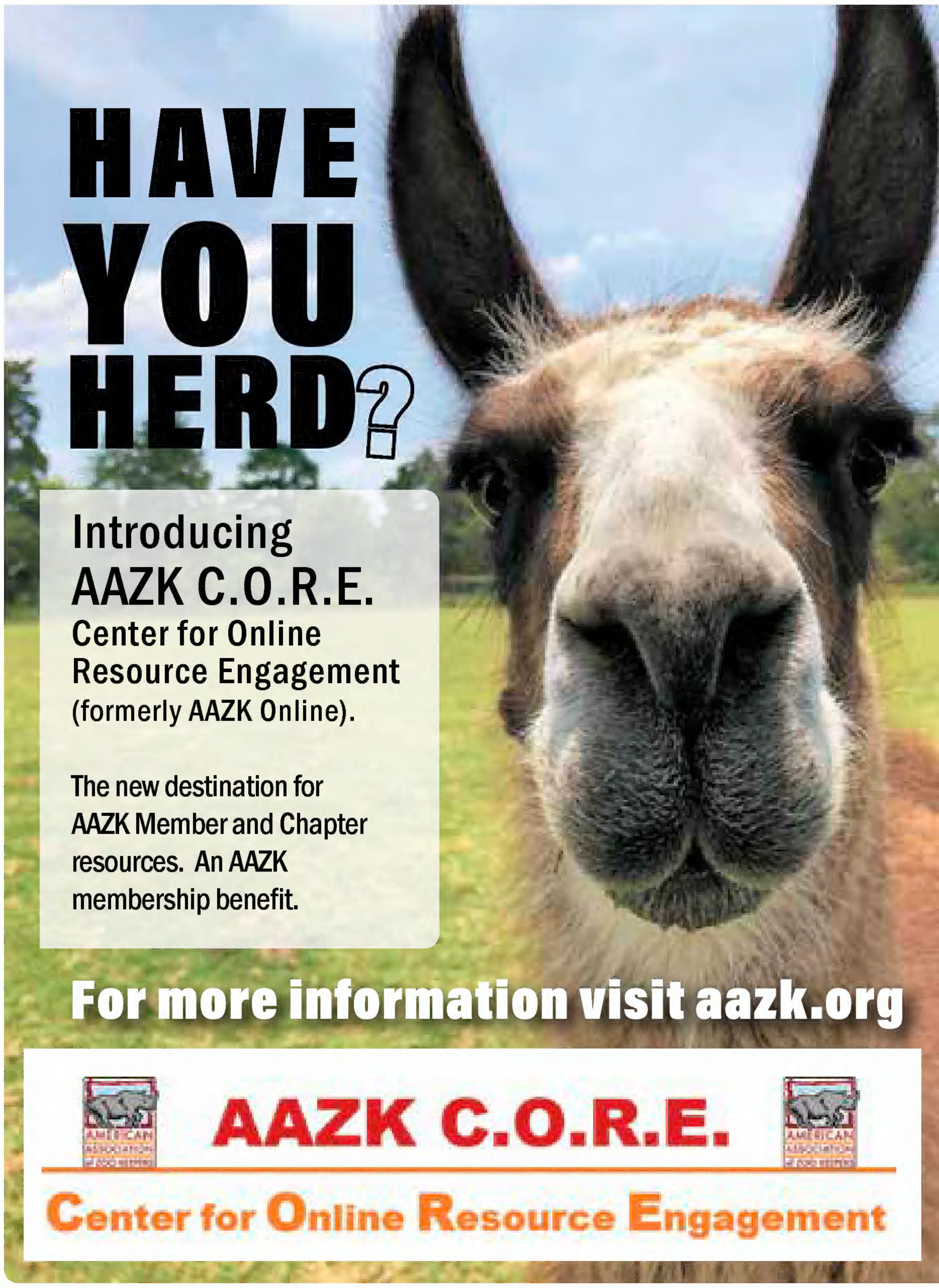

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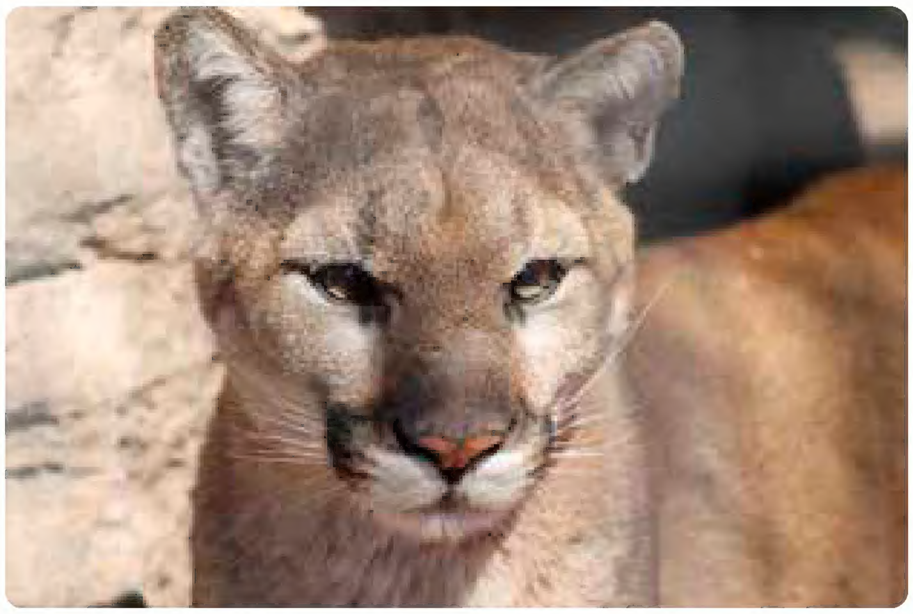


CORRECTION

This photo of a cougar (*Puma concolor*) appeared in the June 2021 issue of the AKF. The photo should have been credited to Ashley Burdick. We regret the error.

Creating Connections to Islands Far, by Connecting to the People Near: Building a Madagascar exhibit with the human element in mind

Brittany Behler, Animal Keeper
Idaho Falls Zoo at Tautphaus Park
Idaho Falls, ID

"Culture is a way of coping with the world by defining it in detail."
By Malcolm Bradbury.

INTRODUCTION

When creating an experience for our guests, we often focus on the species represented; the threats, the habitat, and their life histories. The value of these educational pieces are critical to helping us as zoo professionals connect our neighborhoods to the wild world outside their doors. Yet when we talk about these aspects, they are only expressing one side of conservation. When creating new signage for an exhibit that highlights the island ecosystem of Madagascar for example, it can be approached in many ways: highlighting the limited resources, the struggles of the species that live there, and the human impacts that can determine the fate of these delicate ecosystems. However, there is one major element missing from the picture we attempt to build with our graphics; the people who share the space with these species. Many factors contribute to the endangerment of species, especially on an island like Madagascar. It is our responsibility as zoo professionals to give our guests a picture that can create empathy for the ecosystem and the species it serves; animal or human.

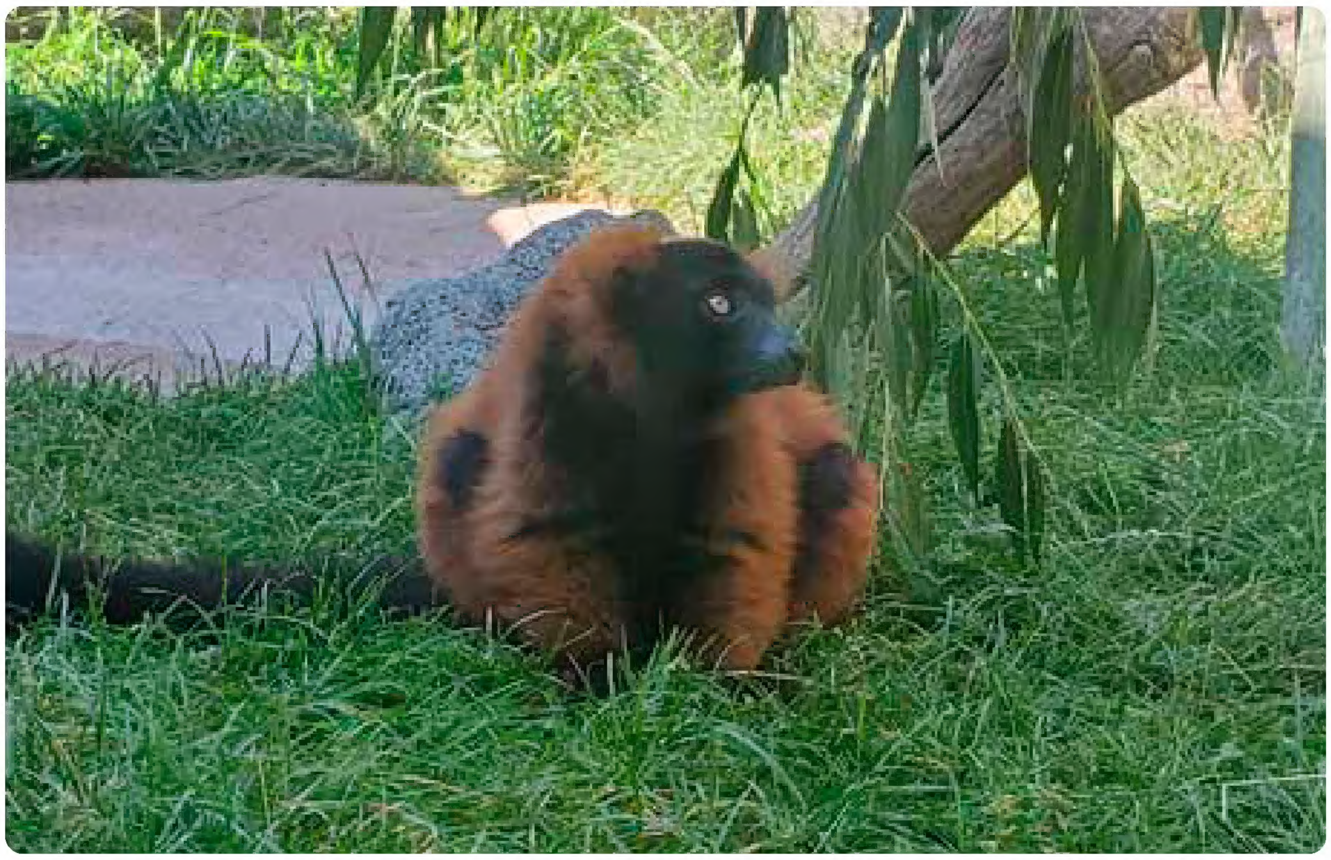
THE PEOPLE OF MADAGASCAR

The endemic animal species are not the only ones struggling in Madagascar, the humans that call the island home can help us understand why that is. A way that we can understand a country's life satisfaction is through the Happy Planet Index (HPI). Happy Planet Index is based on human well-being in relation to the environmental impact of that country. With HPI, subjective life satisfaction, ecological footprint per capita, and life expectancy at birth can be rated on a scale that is universal and easily quantifiable. These values suggest the acknowledgement of impact as well as the action of protecting the country's people by restoring the local environment. The country that led the world in 2020 is Costa Rica with a 76.1 HPI rating. Costa Rica also counters their own carbon footprint through planting trees once they are harvested, and has many successful recycling programs. The country encourages their citizens to live healthy, long, and fulfilling lives while not threatening the opportunity for future generations to do the same.

At the other end of the spectrum, the United States of America (U.S.) ranks #114 with a HPI of 30.7. This lower ranking is primarily due to the country's large ecological footprint when compared to its population. The United States of America as a whole uses more than its fair share of resources which contributes to planetary damage as a result of that. Madagascar is rated #113 with a HPI of 31.5, considering that it is barely ranked higher than the U.S. with a population of 331 million people compared to 27,857,179 people living on the island of Madagascar (MADAGASCAR COUNTRY REVIEW, 2020). It is concerning for many reasons that a country as small as Madagascar is comparable to a country as large as the U.S. in its environmental impacts. With a smaller population the amount of environmental damage that is happening per person is substantially larger than the U.S. The U.S. luckily has the resources and the ability to help ease their own environmental shortcomings through technological advancements and wealth. An island like Madagascar has very limited resources and relies heavily on their natural resources for their own sustainability. Without the ability to replenish their natural resources or find alternatives like the U. S. or Costa Rica, Madagascar overall does not reverse their environmental impact faster than they damage it. The implications of this put tremendous pressures on the people and animals of this island, which can lead to desperation and conflict between the human and animal residents.

BUSHMEAT

Bushmeat is a common threat to native wildlife in economically poor regions of the world, including many areas of Madagascar. In Madagascar over 90 percent of the population live on less than two USD per day. Bushmeat is the collection or hunting of exotic meats and commonly refers to smaller species like lemurs, fossa, or fruit bats. Many poor communities see the availability of bushmeat as a substantial addition to their overall diets to add needed vitamins and protein that they otherwise do not have easy access to. Not only does bushmeat allow people to feed their families with a more balanced diet; but it can add extra income to a family who



is struggling financially. There are often complex reasons for why bushmeat is consumed or harvested and it has an impact on the biodiversity of a given area. Species may be hunted for different reasons; lemurs are harvested for bushmeat due to insufficient food resources of a family or village. While fossa are a result of human-wildlife conflict dealing often with property (Reuter et al., 2016).

Interestingly enough, the collection of bushmeat is actually illegal in the country but the regulation on it is extremely weak and bushmeat is often found in markets around the island. These markets are common in both urban and rural areas and many people who choose to purchase bushmeat are often opposed to hunting it themselves. Bushmeat is seen as a critical answer to malnutrition in economically poor populations. Struggling with dietary needs is already a huge stressor but when space for resources becomes a factor as well, things can get tricky. With limited resources from island living, these markets do not always offer as nutritious and plentiful options as markets that are found in larger, less restricted countries, like the U.S. or China (Reuter, 2018). The value of space can really alter the potential for growth and opportunity when it comes to making a living from the land. The unregulated markets are essential to the health of the people in Madagascar, yet the act of collecting bushmeat is also destroying the biodiversity that the people rely on.

HUMAN CONFLICT WITH CARNIVORES

Human-Animal conflicts occur across the world in many walks of life. It can be as simple as an animal going through your trash and making a mess, or as extreme as wildlife disrupting your livelihood by killing your livestock. When the conflicts affect livestock, tensions can run high and retaliation can occur that can highly impact biodiversity. Fossa, the largest native carnivore on the island of Madagascar, usually stick to more native prey, yet conflicts with farming communities occur, which often results in small livestock deaths (Hawkins & Racey, 2008). These types of attacks can really cause heavy tensions in a community. Conflict with humans impacts the fossa populations, especially when farmers come into contact with these carnivores. Retaliation for loss of property in terms of chickens or small livestock is often widely accepted in small rural communities due to the large effect on their livelihood. In a study that interviewed over 1,750 households in Madagascar throughout the different forest regions, over half of the households disliked fossa specifically for their predation on poultry. Retaliation killings of fossa may result in extinctions of already small fragmented populations (Merson, Dollar, Johnson, and Macdonald, 2019).

NATIVE HARDWOODS

One of the larger industries the country boasts is the harvesting of native hardwoods. Malagasy rosewood was first documented as being exported in the early 1900s. It is commonly exported for use in musical instruments, luxurious furniture, and rosewood oil which led the species to the brink of extinction. Since this species is endemic to the island, its exportation is a sign of wealth and privilege that also brings in a huge profit to those who harvest it. High demands for the native wood from numerous Asian markets led to the restriction of this exported wood in 1975. From the year 2000 to current day the regulations have been lifted and restricted on the hardwood numerous times. This back and forth of government's involvement creates a higher reward for those who wish to export the wood illegally to foreign buyers (Zhu, 2018).

As of 2017, the Convention on International Trade of Endangered Species of Fauna and Flora (CITES) put heavy restrictions on the export of Rosewood, citing that the high demand of this wood would result in conservation issues as well as violence in the areas where the trees are grown. These restrictions exclude instruments due to the highly sought after sounds that this wood produces when used in guitars and fingerboards (Benincasa, 2019). Rosewood is a critical habitat component for many species in Madagascar yet the price tag on this tree can result in deforestation that can decimate an ecosystem. When the people see a demand that has a large pay off, sometimes the risk is worth the short-term reward.

ILLEGAL PET OWNERSHIP AND TRADE

Pet ownership in Madagascar is an issue that has negative effects on the native species. Lemurs are a popular pet in Madagascar, yet it is illegal to keep them and often there is a lack of education on the subject of lemurs, and their dietary and social needs are mishandled by the pet owner. According to a national self-assessment survey conducted between 2013 and 2016, it was estimated that between 24,846 and 33,428 lemurs reside in some sort of residence (Reuter et al., 2019). This number encompasses both urban and rural homes, yet tourist towns were seen to have more visible lemur pet ownership present than in other locations. In larger villages, the impacts of pet ownership can highly affect biodiversity; especially if there is a specific interest in one species over another. Ring-tailed lemurs were noted to be the most popular and most recognizable when it came to pet ownership. Many people across the world recognize this lemur species due to its appearance in media and being the sort of "face" of lemurs as a whole (Reuter et al., 2019). This has made them a higher target for pet ownership and illegal poaching due to this attraction. According to Scientific American, it is estimated that 28,000 lemurs have been stolen from the wild between 2012 to 2015. These lemurs are often used to attract tourists to establishments, typically by being chained to walls inside a restaurant or gift shop. Though it is not known specifically how much money one can gain from the presence of lemurs in their establishments, it is seen as a common practice since tourists often identify lemurs with the country as a whole. Though not all people who house lemurs in their homes treat them poorly intentionally, many stereotypic behaviors arise in individuals that are not housed correctly or fed proper diets. The government attempts to confiscate lemurs when they are reported in homes or discovered in pet trade situations, but the number of lemurs that are seized often outnumber the available space at organizations set up to aid them. Funding is also of concern when it comes to housing and feeding lemurs that have experienced the horrors of the pet trade or have had negative impacts from being a pet (Platt, 2015). With the struggles the people of Madagascar experience being one of the world's poorest countries, it is understandable why individuals may participate in the illegal pet trade. Risking the punishment of poaching for a financial reward can make or break being able to feed a family. If the demand of these species continues, the extraction of lemurs will continue to occur, slowly destroying the ecosystem stability of Madagascar.

CONCLUSION

It is human nature to distance ourselves from an act that we see as evil or cruel without understanding why it is occurring. When we cannot relate to the struggles of another we remove our empathy for their situation and how it cascades through an entire country. It is easy to demonize a group of people for the endangerment of a species or many species we as humans enjoy. Though we may not understand why the people of Madagascar own lemurs as pets, poach, hunt for bushmeat, or participate in deforestation; we must look at all these pieces to see the picture of why conservation efforts are needed and how we can work with the people to achieve our goals. To connect our guests to the creatures we love, we must also build a bridge of empathy to our fellow humans who cohabitate with these amazing animals we represent. If we look down upon people who do not live like we do, we will never see their point of view.

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The Constructional Approach to Addressing Fear Responses and Aggressive Behavior

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INTRODUCTION

In zoological settings caregivers are training everything from snarling big cats to flighty herds of antelopes. Traditionally the first step has involved delivering preferred food items. But some animals present such extreme fear responses or aggressive behavior in the presence of humans, that food holds little value. Trying to use desensitization, counterconditioning and keeping animals below threshold can be challenging to apply for many reasons. Results are often slowly realized in these cases, if at all. The constructional approach empowers animals to replace fear or aggressive behavior with desired responses. Using this procedure, the animal is approaching to accept appetitives often within one or two sessions. When applying the constructional approach in zoos, there are a number of different challenges to address such as enclosure design, limited visibility, needing to know the natural history of the species, and how to apply the protocol to a group of animals. This article addresses questions such as what is maintaining undesired behavior, why the usual advice of superimposition of positively reinforced behavior is less successful, and why behavioral interventions are non-linear. It will also explore how the constructional approach has helped a variety of species of animals commonly cared for in zoos.

THE CONSTRUCTIONAL APPROACH

Israel Goldiamond was a leader in the experimental analysis of behavior. His research led to effective methods for addressing challenging problem behaviors. One such contribution is the constructional approach. The work of Goldiamond (1975) often involved patients who were unable to communicate using verbal language (aphasic). This was often the result of stroke, brain injury, dementia, or other pathology. Traditionally, patients identified as experiencing distress were treated following a medical model with the focus being on the pathology, and relief of symptoms. The constructional approach rejected this model and encouraged practitioners to build (construct) new repertoires of behavior as an alternative. For example, instead of decreasing stuttering, the client was taught to increase his vocabulary of words. Instead of decreasing a phobic response to spiders, a new behavior was selected that resulted in the desired consequences of attention and touch from a spouse (Goldiamond, 1975; Goldiamond, 2002).

Goldiamond (1975) observed that typical treatment plans focused on what the patient could not do as opposed to what the patient could do. It was also noted that the behavior of patients frequently resulted in reinforcement. However, behavior that was increasing was often identified as undesired, possibly resulting from frustration when the patient did not have an alternative way to communicate desired outcomes. Examples included a patient who would cry until taken for a walk, a recovering stroke patient going into a rage to get food delivered quickly, and another who would scream to avoid physical therapy (Goldiamond, 1975).

The constructional approach recommends identifying a target behavior and looking for behavior that is currently available for a starting point, as opposed to looking for what is absent (Goldiamond, 2002). From this point a desired behavior can be shaped. The constructional approach has also inspired the animal training community. A significant impact has been the introduction of a nuanced application of procedures for addressing undesired behaviors identified as being maintained by negative reinforcement, such as aggressive behavior (Snider, 2007). As Snider (2007) describes, this procedure involves the presentation of an aversive stimulus at extremely low potency or under a context that allows the stimulus to be at extremely low potency. This allows the animal the opportunity to present desired behavior in the presence of the aversive stimulus. The aversive stimulus can then be removed upon presentation of desired behavior. This procedure can allow the construction of a new response in the presence of the stimulus. It can also facilitate transition to the use of positive reinforcement or be used in conjunction with positive reinforcement (Snider, 2007). This has been extremely useful in my work as a zoo training consultant when trying to establish a starting point with exotic animals presenting extreme fear responses (or aggressive behavior) in the presence of humans, for example with a wild caught herd of antelope.

The constructional approach was significant in that it asked clinicians to focus on the ability rather than the disability of their patients. It also demonstrated that pathology does not have to be an obstacle to reaching behavioral targets (Goldiamond, 1975). And in the animal community it is now helping trainers make progress in cases of extreme fear responses and/or aggressive behavior wherein the past it had been difficult to demonstrate considerable long lasting success rates (Snider, 2007).

Rosales-Ruiz (2021) has also pointed out that fear responses and aggressive behaviors are generally regarded as respondent behaviors. And traditionally trainers have been advised to use only respondent conditioning techniques, such as desensitization or counterconditioning. The focus of these procedures is on changing the animal's emotional state towards the aversive stimulus. However, these can many times be almost impossible to apply in zoological settings with animals presenting such extreme responses that no appetitive will overcome the strength of the aversive stimulus, even over many days, possibly even months. Often no significant changes in behavior are observed, or the response is that of an obviously uncomfortable animal attempting to collect the desired item while forced to tolerate the presence of the aversive stimulus. Additionally, the respondent behavior may have occurred in the initial interactions with the stimulus. Subsequent responses are likely operant in which behaviors emitted by the animal in the presence of the stimulus result in desired outcomes, such as increased distance (Snider, 2021).

Other common procedures to address fear responses and aggressive behavior include trying to directly shape a calm response using food or other appetitives. Again, if the animal is unreceptive to appetitives there is often little option for success unless the trainer is willing to consider deprivation tactics that may have the potential to compromise animal welfare.

As has been discussed, another option is to recognize that fear responses and aggressive behaviors can be seen as successful behaviors that are maintained by negative reinforcement. Engaging in these behaviors leads to giving the animal a desired outcome, increased distance from something that the animal finds aversive. For example, a tiger learns that when he growls, keepers go away and leave him alone (Rosales-Ruiz, 2021). This view offers an alternative approach to addressing these problem behaviors. When applied properly, distance can be used as a reinforcer to shape calm behaviors that replace fear responses or aggressive behaviors. Using this approach has the potential to expose the animal to a much less potent aversive stimulus than using counter conditioning in which the pressure for the animal to tolerate the presence of the aversive stimulus may be greater.

APPLICATION OF THE CONSTRUCTIONAL APPROACH

To address an animal that has history of presenting a fear or aggressive response to the presence of the trainer, the following steps can be applied:

1. Start far enough away that the animal is aware of the person but shows calm and relaxed body language.
2. Approach so that the animal can see the person until the slightest body language (or none) is observed and so that the animal acknowledges the person has moved. When this happens, stop moving.
3. Wait until the animal presents any behavior that is acceptable that would be considered calm (looks away, scratches, rests its head, eats, closes eyes, etc.), then walk away.
4. Repeat this and raise criteria (move closer.)
5. Continue this process until the animal is only presenting calm body language in the presence of the trainer.
6. At this stage, several things may happen. Some animals may begin to approach the trainer, which can be negatively reinforced by walking away. Others may appear to be very relaxed and be willing to be close. Either way this is a signal to try to introduce an appetitive stimulus (desired item) such as food.
7. Trainers may need to use desensitization to slowly introduce offering food or may need to toss food closer and closer to encourage animals to approach.
8. This step is called the switchover and can happen fast. The training strategy can now focus on positive reinforcement for desired behaviors.

An important feature of using the constructional approach to address fear responses and aggressive behavior is that the trainer is using a function-based intervention. When a behavior is maintained by negative reinforcement that is not contrived, in other words aversive stimuli that are already existing in the environment when removed increase the undesired behavior, then the intervention should be based in negative reinforcement. When trainers use the constructional approach, they are using a non-coercive application of this procedure. This allows caregivers to address the actual contingency maintaining the behavior as opposed to attempting to superimpose positive reinforcement for some other behavior on top of the already existing negative reinforcement contingency for fear responses or aggressive behavior. Affiliative behaviors (approaching, investigation, sniffing, etc.) are also often observed when the procedure is applied correctly. This seems to indicate the characteristics of the stimulus transition from aversive to appetitive. Additionally, trainers are very quickly able to transition to positive reinforcement when affiliative behaviors are observed.

CHALLENGES IN ZOOLOGICAL SETTINGS

The constructional approach can be challenging to apply properly because it does require sensitivity to animal body language. Excellent shaping skills are required whether using positive or negative reinforcement. Trainers may need to practice refining their skills. It is important animals have the opportunity to be far enough away that they can present behavior that is relaxed and comfortable. Animals also need time to relax and reach hormonal homeostasis in between repetitions in the event criteria was raised too quickly (Stress hormones return to baseline). It is possible to flood an animal if it cannot escape the approaching stimulus. An indicator this may have happened is if the animal gives little to no behavior to reinforce.

In zoological parks it can be difficult to get far enough away and still have line of sight due to enclosure design. There can be pressure to apply procedures in a timely manner. There are challenges with visibility with animals in areas that are dark, and it is difficult to see the animal's body language. Of greater challenge is working with herds and flock animals. For these animals it is important to not push for an observable reaction at all. Approach and retreat before any observable reaction is noticed. There are responses occurring, just not ones that are easily observed. Reinforcing this much calmer response is desired over pushing for any noticeable body language associated with fear (or aggression.) Tipping one animal into a fear response can cause the entire group to alert and the process may need to begin again at lowered criteria. Those inexperienced with the procedure may wish to seek guidance from an experienced mentor.

SUCCESS STORIES

Despite these challenges, my clients and I have had excellent success utilizing the constructional approach to address fear responses and aggressive behavior with the species listed below:

Fear Responses:

- Kudu (*Tragelaphus strepsiceros)* – herd captured from the wild
- Gemsbok (*Oryx gazella)* - herd captured from the wild
- Springbok (*Antidorcas marsupialis)* - herd captured from the wild
- Blesbok (*Damaliscus pygargus phillipsi)* – herd captured from the wild
- Red Fox (*Vulpes vulpes*)
- Somalian Wild Asses (*Equus africanus somaliensis)*
- Grey Wolves (*Canis lupus)*
- Grant's Zebra (*Equus quagga boehmi)*
- Bald Eagle (*Haliaeetus leucocephalus)* - rehabilitated wild caught individual

Aggressive Behavior:

- Sumatran Tiger (*Panthera tigris sondaica*)
- Proboscis Monkey (*Nasalis larvatus)*
- Western Lowland Gorilla (*Gorilla gorilla)*
- Arabian Tahr (*Hemitragus jayakari)*
- Wildebeest (*Connochaetes gnou)* (wild caught male)
- Ocelot (*Leopardus pardalis)*
- Spectacled Owl (*Pulsatrix perspicillata)*
- Rhinoceros Iguana (*Cyclura cornuted)*

Many of these examples involved single session transformations in which animals went from displaying fear responses or aggressive behavior to switching over to accepting food or other appetitives while presenting calm body language within one 20-40-minute training session. (Video of many of these sessions can be seen in the course by Heidenreich (2019) in virtual learning program AnimalTrainingFundamentals.com)

CONCLUSION

Many animal trainers have been taught that negative reinforcement is inherently coercive. Others might argue, myself included, that it is more coercive to force an animal to try to accept food in the presence of an aversive stimulus when its body language is demonstrating a clear fear or aggressive response. It is also important to avoid confusing principles with procedures. While there is one (generally) accepted definition for each principle, there are literally thousands of procedures. When negative reinforcement is described as used in the constructional approach it is very different than when using coercive applications (for example, using a sheep dog to herd sheep through a gate.) It is the same *contingency,* but a very different procedure. The impact of the two different procedures can result in very different welfare for the learner. And because procedures can be endlessly complex and varied, it is overly simplistic to funnel it down and say because the trainer used a specific contingency it is therefore labeled humane, or inhumane. The most accurate evaluation would be to look at an *individual* procedure and measure it for its impact on animal welfare.

Also important to consider is if the existing contingency is not contrived, then giving the animal the reinforcer it desires (an aversive stimulus to go away) is the opposite of coercive. It can be empowering and used to shape desired behaviors. Coercion would be trying to superimpose a positive reinforcement contingency on top of the already existing negative reinforcement contingency maintaining the fear response or aggressive behavior (for example as stated earlier, trying to force the animal to accept food in the presence of people it finds aversive.) Instead, with the constructional approach the quality of the stimulus can be changed from aversive to appetitive.

The constructional approach offers a highly effective, more function-based strategy in which the animal is empowered to present a new behavior to control its environment without being pushed over threshold. It can be used to introduce new people, objects, and when used in reverse can even help address animals which are uncomfortable being separated from conspecifics. It also often produces results relatively quickly. While there are challenges in applying it in the zoo environment, it is without doubt a procedure that can greatly help caregivers quickly connect with the animals once thought impossible to train, thus opening the door to many more opportunities to improve animal welfare with evidence-based training technology.

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Barbara Heidenreich is an animal training consultant specializing in exotic animals. She consults worldwide working with zoos, universities, veterinary professionals, and conservation projects. She has worked onsite with over 80 facilities in 27 countries. She is an adjunct instructor at Texas A & M University. She has produced seven DVDs, authored two books, and contributed to four veterinary textbooks. She is a co-author of the Fear Free® Avian Certification Course. Much of her work focuses on training exotic species to cooperate in medical care. She operates the online education program www.AnimalTrainingFundamentals.com. This virtual learning program features award winning courses, tracks to guide professional development, verifiable badges to share and prove course completion, community, and more. Barbara is an advisor for the Animal Training Working Group and the Parrot Taxon Advisory Group for the European Association of Zoos and Aquariums. She has provided her expertise to conservation projects The Kakapo Recovery Program and The Borneo Orangutan Survival Foundation. She has a Bachelor of Science in zoology and is currently earning a Master of Science in applied behavior analysis. Her goal is to leave behind a legacy of kindness to animals by sharing her expertise.

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A Zookeeper's Guide to Navigating OSHA Regulations

Kathryn Juliano, AAZK Safety Committee Vice Chair

OSHA, the Occupational Safety and Health Administration, was created in the United States in 1970 by Congress when the Occupational Safety and Health Act of 1970 was passed (About OSHA). OSHA is part of the US Department of Labor, making it a government entity. Every worker is covered by the Occupational Safety and Health Act with a few exceptions, including family farms, self-employed workers, and workplaces covered by other laws, including mining and railroads.

OSHA exists to ensure safe and healthy conditions for working men and women. To reach its goal, OSHA has two driving actions; first, they set and enforce standards. Second, OSHA provides training, education, outreach, and assistance on different safety topics. This article will focus specifically on the standards and enforcement of standards by OSHA.

OSHA standards and regulations absolutely apply to zoos and aquariums and their employees. By learning about the details of OSHA standards, facilities can ensure they are following the law, make their workplace safer for their employees, and prepare for inspections. Employees also benefit from learning about OSHA standards. They can take an active role in their own safety and health and ensure that their rights are being met appropriately.

However, it can be difficult for the average person to even find OSHA standards, let alone break down the legal jargon and figure out what applies in a specific situation. This article will explain how to find OSHA standards, understand legal writing, and review common standards that apply to animal keepers.

HOW TO FIND OSHA STANDARDS

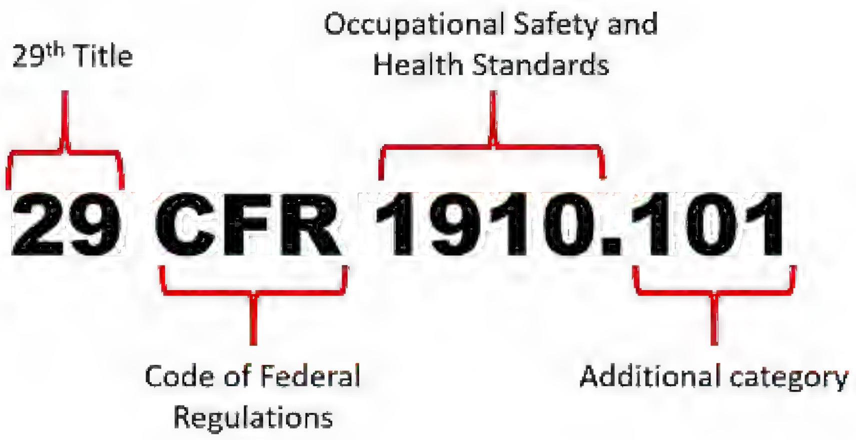
OSHA standards are written into the Occupational Safety and Health Act of 1970. This act is a permanent federal statute of the United States and can be located within the United States Code in title 29, chapter 15. Some applicable language is also found in the General Duty Clause, Section 5(a)(1). These designations help organize the OSHA standards and make them easier to find if someone is familiar with the system.

All OSHA standards will be listed on the OSHA website: www.osha.gov/laws-regs. Because every standard is part of the United States Code, they will always begin with 29 CFR, which stands for the 29th title of the Code of Federal Regulations. After that, each standard will be grouped into one of two sections, either Occupational Safety and Health Standards (1910) or Safety and Health Regulations for Construction (1926). Following the section, additional numbers designate further categories. For example, 1910.101- 1910.126 includes all sections about hazardous materials.

Zookeepers may find that the Standards for General Industry in Section 1910 apply to them the most. However, if a keeper is performing construction activities, which can include exhibit renovation or new construction, they should pay additional attention to the Standards for Construction (1926). Additionally, some standards are horizontal and "cross over" disciplines, including fire protection and first aid standards. Check both Section 1910 and Section 1926 to ensure you're getting the correct information.

Some sections have further designations. For example, 29 CFR 1910.157 includes all legal requirements for portable fire extinguishers. The letter C designates parts of the code that discuss general requirements, while the letter E covers inspection maintenance and testing.

Navigating the OSHA standards is complicated! The standards are legally written documents and understanding how to read legal jargon is complicated by itself. OSHA has many additional resources to help identify standards and learn more about


29th Title
Occupational Safety and Health Standards
29 CFR 1910.101
Code of Federal Regulations
Additional category

them. For example, if you look up “heat” on the OSHA website, you will find the standards but also educational materials, graphics, and videos. Hopefully this article can also serve as a quick guide to finding applicable standards when working in a zoo or aquarium.

Looking for further advice on understanding legislation? Always check the definition of a term that is mentioned- something like “exotic animal” can mean that very specific animals are included or not included. Look for action words and exceptions. There’s a huge legal difference between “may” and “must”, and exceptions like “only” and “under” can change the entire meaning of a standard. Finally, be careful when looking at “quick guides” that don’t come directly from OSHA. Someone else could easily be misinterpreting a standard- reference their information with the OSHA regulations whenever you can.

STANDARD VS. GUIDELINE

As previously mentioned, OSHA has two main ways of accomplishing their goal- they create and enforce standards and provide training and education. It can be very easy to mistake their educational materials and training for actual standards. It’s very important to distinguish between what OSHA considers a legal requirement and what they consider a recommendation.

For example, OSHA actually has very few standards for working safely in the heat. The only applicable standard is the General Duty Clause, which requires employers to provide a place of employment free from recognized hazards. Recently, courts have interpreted this standard to include heat-related hazards (OSHA Heat Stress Standards). However, there are no specific criteria for preventing heat-related hazards. There are recommendations created by NIOSH (National Institute for Occupational Safety and Health) that detail ways to minimize the risk of heat-related hazards, including wearing appropriate clothing, providing frequent breaks, using fans, implementing a buddy system, and providing adequate amounts of cool drinking water. Employers are not required by law to institute any of these recommendations.

In contrast, fall protection has many recommendations and many standards. OSHA has created multiple educational materials, fact sheets, posters, videos, and recommendations. However, there are also many standards that exist, including standards related to holes, ramps, excavations, ladders, dangerous equipment, bricklaying, steep roofs, and a standard for training on fall protection. Employers are required to meet all of these standards.

As an employee of a zoo or aquarium, it’s important to know the difference between a standard and a recommendation, because an employer is only required to follow standards. An employer does not legally have to provide you with fans or drinking water, although they could be in danger of violating the General Duty Clause if the environment is extremely unsafe. However, an employer does have to provide appropriate ladders that meet specific criteria. Knowing the standards and recommendations can help you ensure that your working environment is following the law and that you are safe.

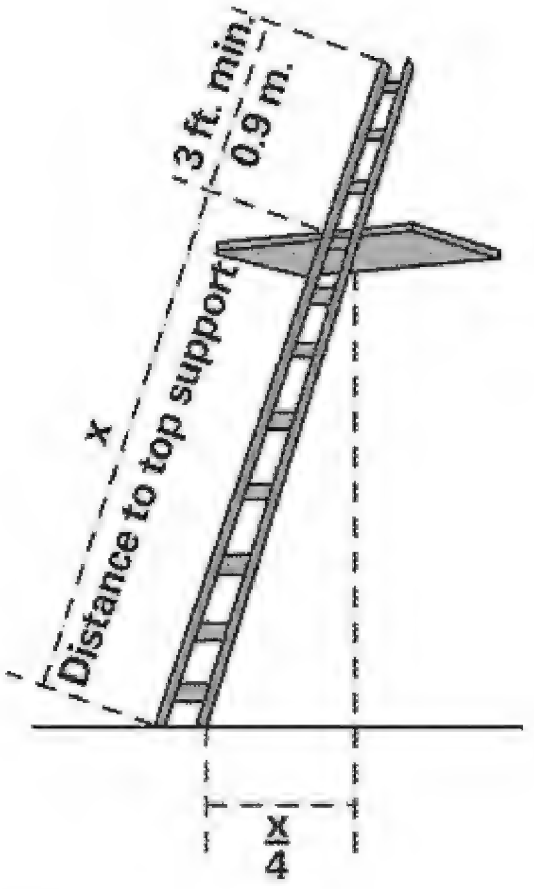


Figure D-1 Portable Ladder Set-up

Example of a figure depicting proper portable ladder set-up from OSHA regulation 29 CFR 1910.21-1910.30.

FREQUENTLY CITED STANDARDS

The following is a brief list of commonly applicable standards for zoo and aquarium employees- it is not an extensive list. This list should also be considered a brief summary and not a definitive guide. For any specific details, check the standards online at www.osha.gov/laws-regs. This list should simply make it easier to identify and access related standards.

Walking-Working Surfaces: 1910.21-1910.30

This section includes standards for ladders and fall protection systems. Ladders have very specific standards for the distance between rungs, minimum clear width, and general condition of the ladder. There are also very specific standards for how portable ladders must be used. Notably, an individual cannot be over six feet from the ground without fall protection and cannot use portable ladders to perform routine climbing.

Noise: 1910.95

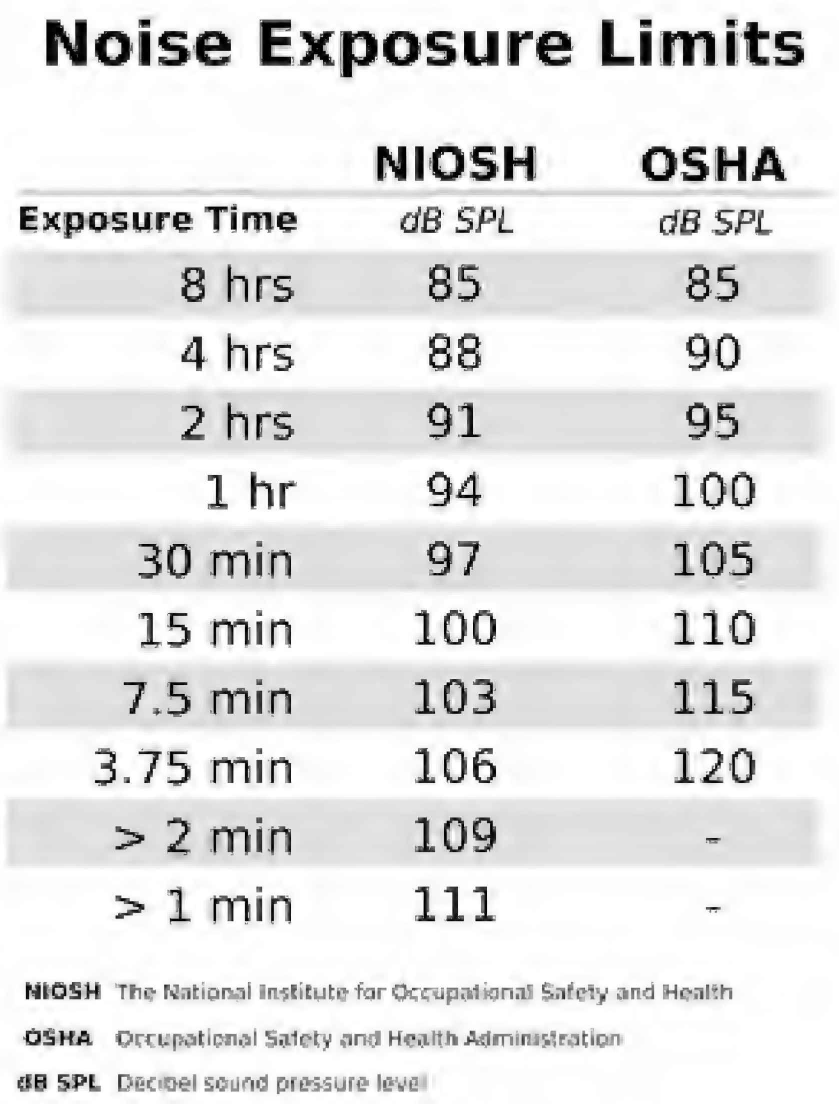
OSHA has specific standards for harmful sound levels and requirements for hearing protectors. If an employee is exposed to noise that measures over 85 decibels for 8 hours on average, their employer is required to provide them with hearing protection. This standard also includes charts demonstrating what kind of protection is required if the employee is exposed to long durations of higher decibels.

Personal Protective Equipment: 1910.132-1910.140

The employer must provide training for Personal Protective Equipment (PPE) use and test for proper fit. The employer must pay for PPE, except for everyday clothing and skin creams, like sunscreen. OSHA has specific standards for eye protection and eyewear, head protection and headwear, and foot protection and footwear. Respiratory protection has many standards depending on the type of hazard the employee is exposed to, which can include silica and asbestos. Some PPE cannot be used without testing and evaluation by a Certified Industrial Hygienist or Certified Safety Professional to identify the hazard and provide the appropriate PPE.

General Sanitation: 1910.141

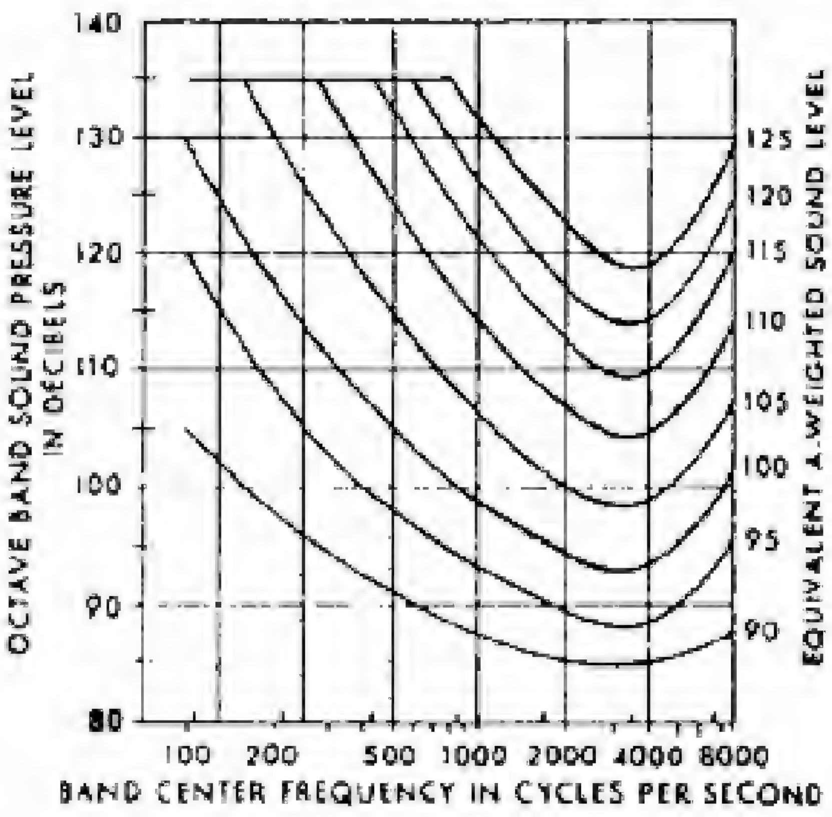
OSHA has specific standards for toilet facilities in an area, along with waste disposal, potable water, and vermin control. If working clothes are provided by an employer and are washed between shifts, the employee must provide clothes drying facilities. Employers are also required to provide an eating or drinking area and a sanitary food storage area that are away from toxic materials.



Noise Exposure Limits

	NIOSH	OSHA
Exposure Time	dB SPL	dB SPL
8 hrs	85	85
4 hrs	88	90
2 hrs	91	95
1 hr	94	100
30 min	97	105
15 min	100	110
7.5 min	103	115
3.75 min	106	120
> 2 min	109	-
> 1 min	111	-

NIOSH The National Institute for Occupational Safety and Health
OSHA Occupational Safety and Health Administration
dB SPL Decibel sound pressure level



Example of a chart demonstrating different levels of sound exposure from OSHA regulation 29 CFR 1910.95.

Medical Services and First Aid: 1910.151

If an infirmary, clinic, or hospital is not close to the workplace, a person must be trained to adequately provide first aid. Adequate first aid supplies must be available. OSHA offers recommendations for first aid kits but does not have any standards about first aid kits.

Fire Protection: 1910.155-1910.165

OSHA has specific standards for fire extinguishers, fire brigades, sprinkler systems, and fire detection systems. Portable fire extinguishers must be provided based on the classes of workplace fires and must be inspected visually monthly and receive an annual maintenance check unless they are a stored pressure extinguisher, which requires a check every six years.

Electrical: 1910.334

This specific section includes standards for using extension cords, portable fans and heaters, and outdoor fans and heaters. It describes how to properly use extension cords and circuits to avoid overloading and using properly rated equipment.

Diving: 1910.401-1910.440, 1926.1071- 1926.1091

Diving can be classified as commercial diving or scientific diving- the standards are very different between the two. Recently, court cases have decided that many aquarium employees are conducting “scientific diving”, but employees should check with their employer or with safety officials to learn about the status of diving at their facility. Standards include pre-dive and post-dive procedures, equipment, and recordkeeping requirements.

Hazard Communication: 1910.1200

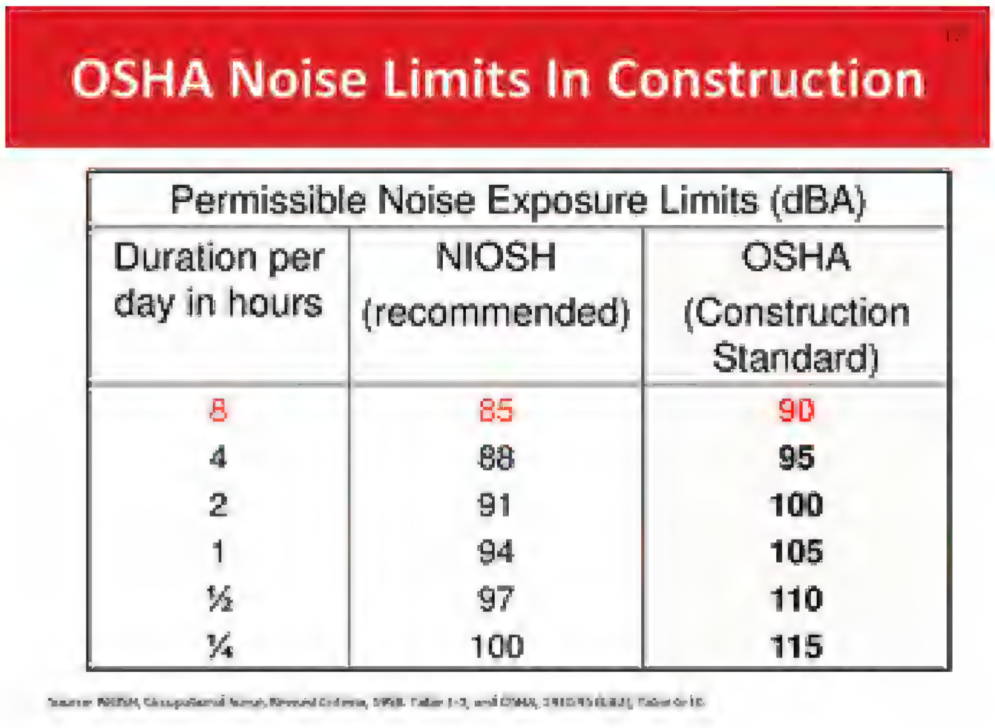
Hazardous materials and chemicals must be clearly identified, and standards are provided for proper labeling. Safety data sheets must be maintained and readily accessible for any hazardous chemicals. Training requirements for staff that may use or be exposed to hazardous materials are also specified.

OTHER REGULATORY BODIES

Workplace safety does not end at the federal level. While OSHA is a federal program, there are 22 OSHA programs that operate at a state level. States can have separate standards or adopt federal standards with specific addendums. States have different regulations as well, especially about diving, that must be considered. Individual facilities can also have their own safety policies and inspections, especially zoos and aquariums that are part of a government organization on a city, county, state, or federal level. Check with your supervisor, your facility’s safety official, or your government’s safety department to learn more about local policies and regulations.

EMPLOYEE RIGHTS

As an employee of a zoo or aquarium, this information should empower you to ensure that your workplace is as safe as possible. You always have the right to working conditions that do not pose serious harm as stated in the General Duty Clause. Past court cases have shown that this clause is somewhat open to interpretation and is often used to protect employees further than specific standards. You are entitled to information and training about chemical and other hazards. You are always allowed to review records of work-related injuries and illnesses. The OSHA 301 Form, or the Injury and Illness Report, is required to be posted in common areas and describes these cases in the past year.



OSHA Noise Limits In Construction

Permissible Noise Exposure Limits (dBA)		
Duration per day in hours	NIOSH (recommended)	OSHA (Construction Standard)
8	85	90
4	88	95
2	91	100
1	94	105
½	97	110
¼	100	115

Source: NIOSH, Occupational Noise, Revised Criteria, 1998, Table 1-1, and OSHA, 1910.95(b)(1), Table G-16.

If you suspect that your workplace is unsafe, you can always file a complaint to OSHA to ask for an inspection. You can get copies of test results that were conducted to find and measure hazards in the workplace. For example, many employers are required to conduct tests to detect asbestos, and you are entitled to view those results. Finally, you are always able to use these rights without retaliation.

OSHA and these standards are ultimately made to protect the employee and ensure that they have a safe workplace. You can take an active role in your own safety- reading this article is a great step. Check for more resources online, ask your immediate supervisor to follow up on safety issues, and see if your facility has a safety expert on staff. These guidelines should empower you to ensure you are safe at your zoo or aquarium.

RESOURCES

OSHA At-a-glance: https://www.osha.gov/Publications/3439at-a-glance.pdf

Five Tips for Reading Legislation and Code: https://www.americanbar.org/groups/government_public/resources/public_lawyer_career_center/Career_Articles/gruwell-article-five-tips-reading-legislation/

Eyewash Interpretation: https://www.osha.gov/laws-regs/standardinterpretations/2009-06-01

Advancing Welfare with a Push of a (Printer) Button

Kara Johnson
Disney's Animal Kingdom®
Lake Buena Vista, Florida

Zoos and aquariums are continuously developing opportunities for animals to thrive in their environments. We often work with a wide variety of species that have very specialized behaviors and needs. This diversity poses a challenge to Behavioral Husbandry (BH) programs, as many of these needs cannot be met by products found on store shelves. We have, therefore, become accustomed to creating training and enrichment devices ourselves. At Disney's Animal Kingdom®, we believe, as technology outside of the zoo world evolves, we can look for ways to utilize newer technologies to meet these needs and help our animals thrive.

One way we have added technology into our BH program is by utilizing a 3D printer. A wide variety of items can be produced by a 3D printer, making it possible to create training or enrichment devices targeted specifically to a species or individual. As technology develops, these printers are becoming less expensive and more user-friendly, making it possible for someone with no background in computers or engineering to successfully create novel devices. Additionally, as 3D printing gains popularity, an ever-increasing pool of specialized 3D printing companies have opened their doors, making it much more accessible to have custom objects created. Utilizing this technology, we are able to create items that are tailored to our individual needs, rather than relying on inadequate devices off the shelf.

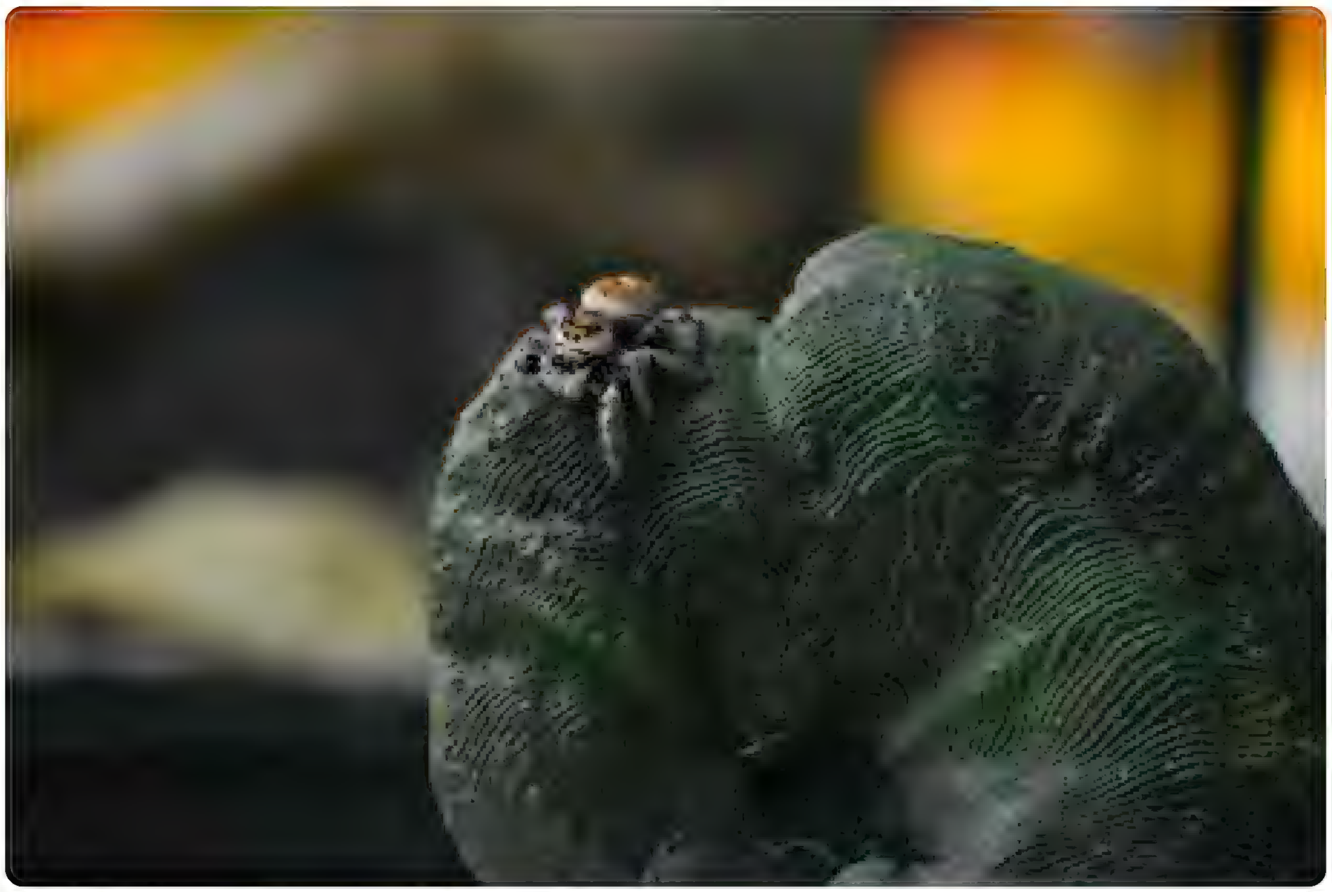
Offering opportunities for our animals to perform their natural behaviors is one of the cornerstones of our BH program and the 3D printer allows

3D printer with completed mushroom print, ready to be cleaned and painted

A 3D printed hippo tusk, painted to look naturalistic, is used as bio-fact by our Education Team

us to create devices that enable such opportunities. One example is a faux ribcage that was designed and printed for our three species of vulture found at Disney's Animal Kingdom Lodge. Keepers smear ground meat or spear kabobs of diet items on the ribs to encourage the vultures to use more intricate feeding behaviors, such as ripping and pulling food items off the bones, which had not been often seen with previous feeding techniques. Another use for the 3D printer has been to create dummy eggs for our waterfowl. Occasionally, for various reasons, eggs must be pulled to be incubated in managed care. Previous techniques for creating dummy eggs were very time consuming and often subject to mold or breakage. Using 3D printing technology, we are able to scan the real eggs and print duplicates that are the exact same size and weight, allowing the birds to safely carry out all of the natural behaviors associated with incubating their eggs.

We can also use the same scanning technology to create unique, natural-looking devices. Enrichment that blends into the surrounding environment is important for the stories we share. Counteractive to this objective, most animal enrichment items in stores are brightly colored, making it difficult to camouflage. The 3D printer allows us to develop items that fit the stories or blend into the animal's surrounding environment. Our 3D scanner enables us to scan real objects, such as hollowed-out coconuts or shelf-fungus found growing on the trees, and produce identical copies with a sturdier plastic. After scanning an object, we can then add attachment points or make the object smaller or larger to fit our needs.



Jumping spider resting on a 3D printed mushroom

A nest basket that is disguised to blend into the trees of our aviary

In addition to enhancing our Behavioral Husbandry Program, the 3D printer has been used in collaboration with other departments within Disney's Animal Kingdom®. Working closely with our Education Department, we have incorporated 3D printing technology into our summer camp programs. Campers help design items for our animal teams and then assist in starting the printer to bring their designs to life. Our Education team also uses bio-facts to connect guests to our animals and they requested a 3D printed hippo tusk to use during their talks. We were able to modify a bone design found online and paint it to mimic a real hippo tusk. Similarly, a Megalodon tooth was needed for a presentation by our Endocrine team. Another free design was found online and we were able to have a life-sized bio-fact to share with guests when a real version was unavailable. Other applications have included our Animal Behavior and Technology team as they were monitoring temperatures in our lion habitat and needed a way to protect the thermometer held in the water bowl. A device that fit snugly into the bottom of the water bowl was designed with a lid that could be twisted off by human fingers, but was flush enough to be protected from curious lions. As word spreads of our 3D printing abilities, our surrounding teams are discovering more and more uses.

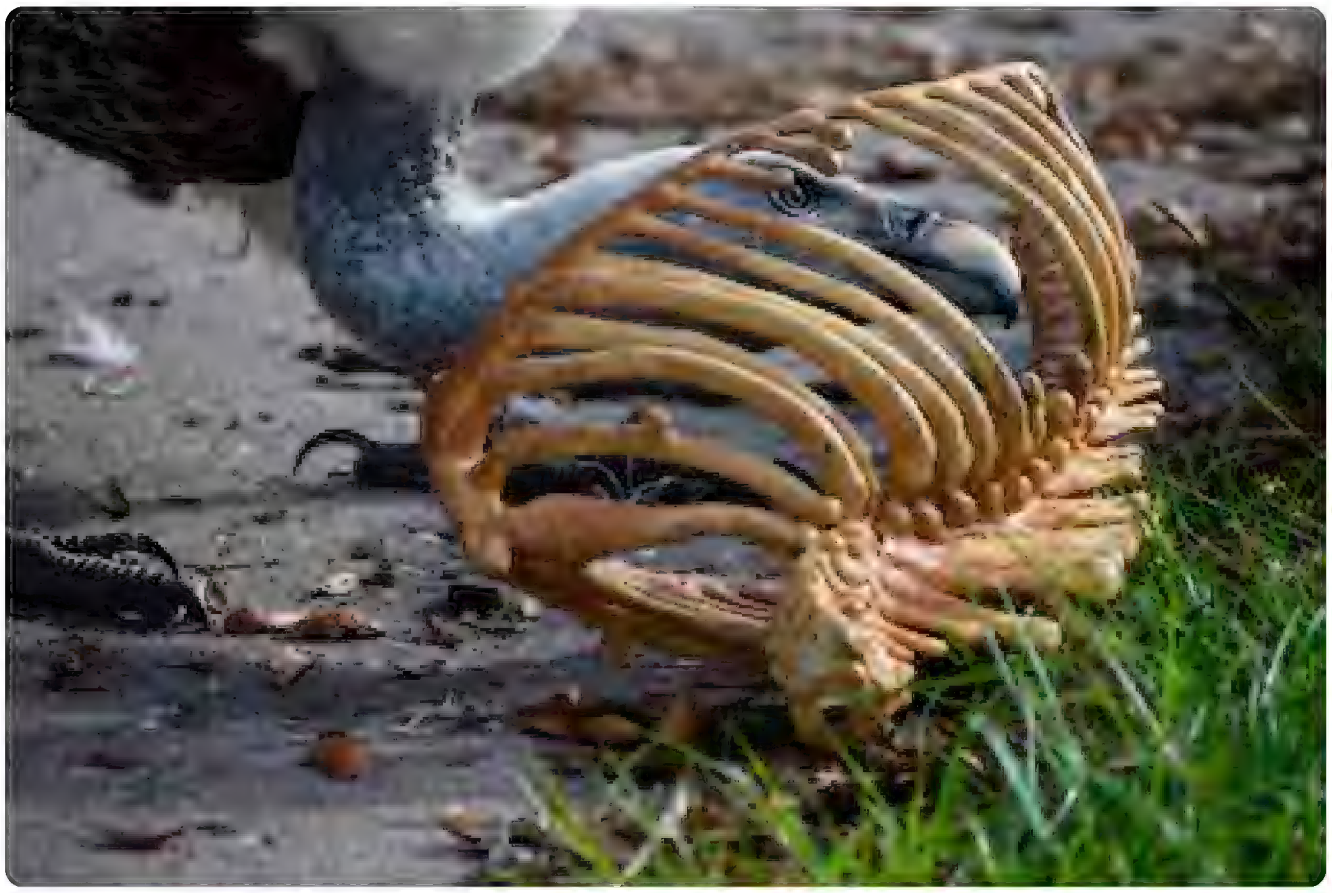
The free designs we have downloaded are a small portion of the resources you can

Summer campers inspecting a nest basket they helped design for our aviaries

find online for 3D printing. There are a plethora of how-to videos on YouTube and plenty of troubleshooting forums to help novice users develop their skills. Additionally, the customer support team for the 3D printer that we use has been instrumental in troubleshooting problems that inevitably arise. If devices are too complicated or too large for our abilities, we have looked to outside companies for assistance. Our Asian small-clawed otters have a device printed by an outside vendor that was able to develop a more complex product and replicate it much more quickly than what we could have done in-house. These companies are gaining in popularity, which has helped drive down the price of outsourcing some projects.

We are still discovering ways that 3D printing can help benefit the welfare of our animals. This technology has allowed us to print objects that are otherwise unavailable, making the possible applications virtually endless and only limited by our imaginations. We can quickly reproduce items and make intricate designs to fit specific needs, and items are durable enough for many species of animals. There are an expanding number of materials used to make the 3D printing filaments, creating even more options and more opportunities for use. All that said, the 3D printer does have some drawbacks; it can take a lot of time to design, clean, and finish items with animal-safe paint or sealant. When a problem arises, troubleshooting can also be fairly time intensive. Additionally, the upfront cost of the printer and filament can be prohibitive for many facilities. However, when possible, a 3D printer can add such value to a behavioral husbandry program. From printing stations for zebras to nesting baskets for our aviaries, the 3D printer has been a multifaceted tool. After using the printer for three years, it feels like we have just scratched the surface of the possibilities and we are very excited to see where this technology takes us.

Vulture picking diet items off a 3D-printed ribcage

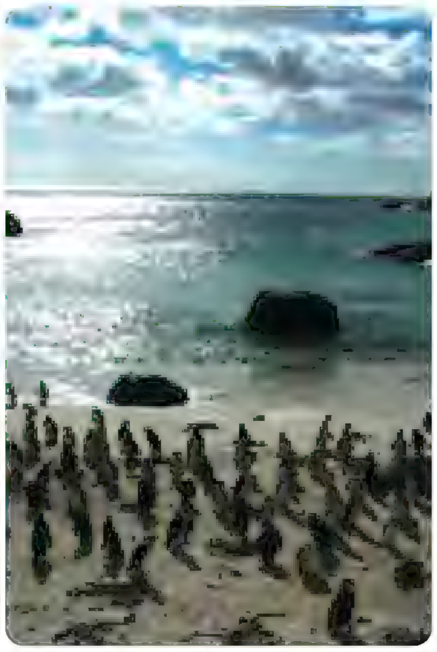


REVIEW

This paper shows great creativity by utilizing a 3D printer to increase natural behavior while presenting a more environmentally-appropriate element to animal habitats. As 3D printers continue to grow in popularity, the cost will be more affordable for facilities but also its multi-use across departments, as presented in this paper, lends itself to sharing costs. The various applications of the 3D printer in this paper was fascinating and shows how ingenuity has increased our animal care.

Steve Sarro
African Penguin SSP Coordinator
Smithsonian's National Zoo
Washington, DC

Gayle Sirpenski
African Penguin SSP Coordinator
Mystic Aquarium
Mystic, Connecticut



HELLO AAZK MEMBERS,

AZA's SAFE programs bring to light the challenges of many species in zoos and aquariums and in the wild. African Penguin SAFE is one of the five original SAFE programs. The African penguin population is in a downward spiral with a 23% drop since 2019.

"Waddle We Do Without Penguins?"

Immediate—Stop the Decline:

- Disaster Preparedness, Response, Rescue and Rehabilitation (Jess Phillips, Maryland Zoo in Baltimore)
- Habitat Restoration including Deploying and Monitoring Artificial Nests (Kevin Graham, Dallas Zoo)

Longer-term essential projects—Understand and Manage Critical Challenges:

- Food/Prey Sustainability (Mike McClure, Maryland Zoo in Baltimore)
- Understanding Movements: Satellite Tracking and Transponders (Ric Urban)

Ongoing projects:

- Colony Health Surveillance, Disease Monitoring and Management (Patty McGill, National Aviary; Gayle Sirpenski, Mystic Aquarium; Steve Sarro, National Zoological Park)
- Local and Global Community Engagement/Education (Elizabeth Mulkerrin, Omaha's Henry Doorly Zoo & Aquarium; Kevin Hils, Wildlife Conservation Society/Bronx Zoo)

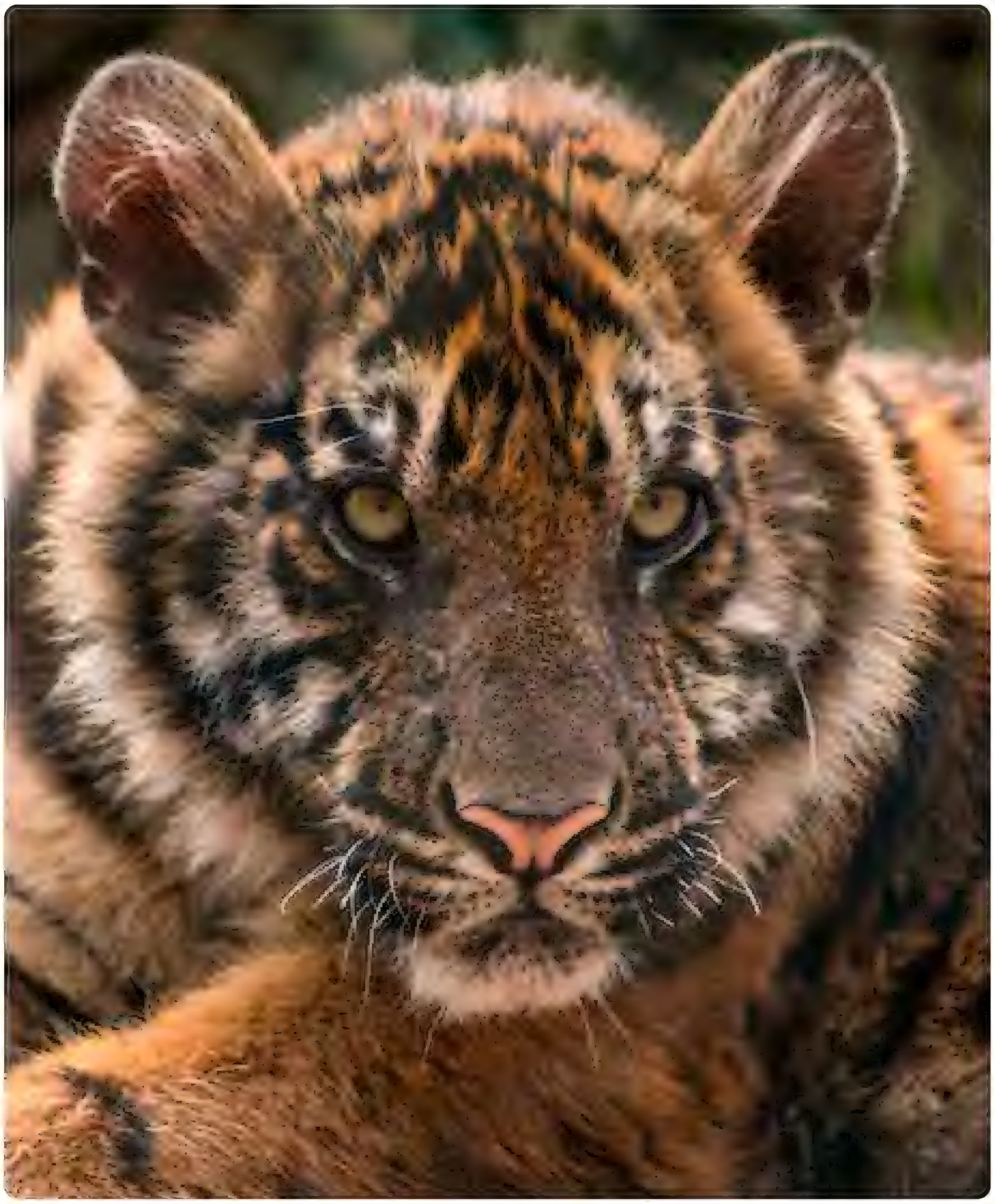
These projects are ambitious but achievable with support. Zoo and Aquarium keepers are the heart and soul of the animal collections and are, literally, the invaluable soldiers that make a tangible, daily difference in our animals' lives. Which assembly of zoo professionals is better equipped to help us than zookeepers? The answer is none!

We are hoping for both individual member support from AAZK as well as Chapter support. Over 20 AAZK Chapters have African penguins in their collections, and with Chapter support, we can accomplish many *in-situ* penguin conservation projects. We will gladly accept any donation but a contribution of $500 or more would be exceptional. We will be applying for a SAFE Grant which is due Oct. 1st. Applicants are required to secure 50% in matching funds, so we are hoping to get commitments by this deadline. Please consider making a funding commitment so we can list it as a matching fund for our grant application.

THANKS IN ADVANCE FOR YOUR HELP AND SUPPORT!

Training a Sumatran Tiger *(Panthera tigris sumatrae)* for Routine Subcutaneous Allergy Injections

Mandi Townzen, Lead Caretaker of Carnivores
Rachel Sides, Lead Caretaker of Carnivores
Oklahoma City Zoo and Botanical Garden
Oklahoma City, Oklahoma



(Left) Poor whisker condition. Photo taken February 2019 by Gillian Lang

INTRODUCTION

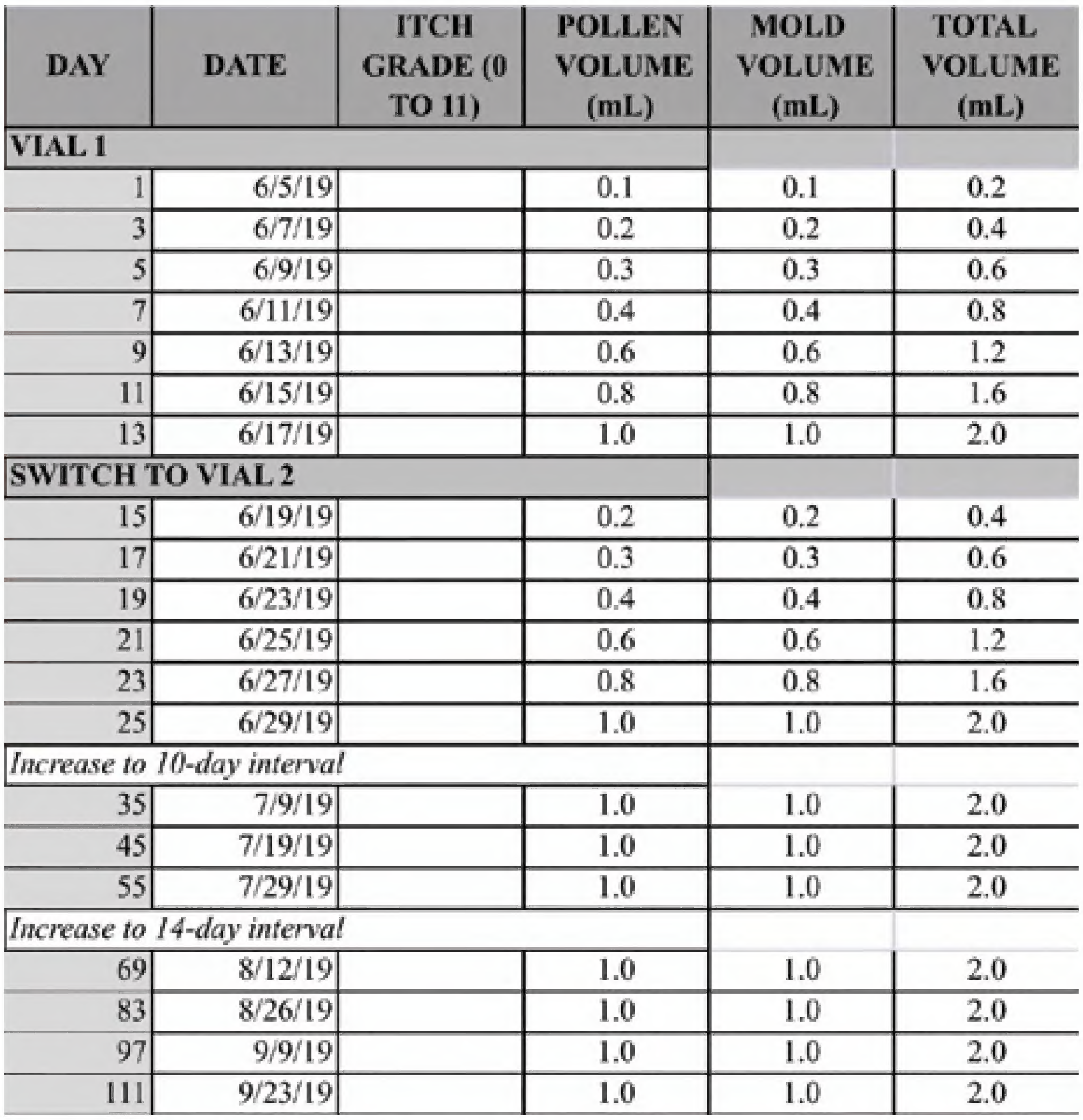
The Oklahoma City Zoo, Oklahoma City, Oklahoma, has been caring for Sumatran tigers for over 20 years. On 9 July 2017 our breeding female gave birth to three male cubs. Upon being separated from the dam at an appropriate age, the three tiger brothers were housed together until a slow separation process began, followed by a complete separation by October 2019. One of the male cubs, Eko, was determined to have relatively severe allergies requiring regular treatment which exceeded the use of oral medication.

BACKGROUND

In the fall of 2019, the carnivore staff began to notice rub marks and scratches on Eko's face. At this time Eko was still housed with his brothers, who were not developing similar scratches or rub marks. Initially, it was thought the scratches might be from wrestling with his siblings; however, Eko seemed to be the only one with these types of markings and whisker breakage. Carnivore staff observed Eko actively rubbing his face on the

Good whisker condition. Photo taken December 2019 by Gillian Lang.

indoor holding fencing, appearing to scratch his snout, indicating that his face was itchy. To try to mitigate his discomfort the veterinary care staff and the carnivore team tried several oral medications including Hydroxyzine (antihistamine), Diphenhydramine (Benadryl®, antihistamine), and Oclacitinib (Apoquel®), however, none of these medications did anything to help lessen his symptoms. Cetirizine (Zyrtec®) was the only medication that seemed to offer some relief, although the symptoms were still present.



DAY	DATE	ITCH GRADE (0 TO 11)	POLLEN VOLUME (mL)	MOLD VOLUME (mL)	TOTAL VOLUME (mL)
VIAL 1					
1	6/5/19		0.1	0.1	0.2
3	6/7/19		0.2	0.2	0.4
5	6/9/19		0.3	0.3	0.6
7	6/11/19		0.4	0.4	0.8
9	6/13/19		0.6	0.6	1.2
11	6/15/19		0.8	0.8	1.6
13	6/17/19		1.0	1.0	2.0
SWITCH TO VIAL 2					
15	6/19/19		0.2	0.2	0.4
17	6/21/19		0.3	0.3	0.6
19	6/23/19		0.4	0.4	0.8
21	6/25/19		0.6	0.6	1.2
23	6/27/19		0.8	0.8	1.6
25	6/29/19		1.0	1.0	2.0
Increase to 10-day interval					
35	7/9/19		1.0	1.0	2.0
45	7/19/19		1.0	1.0	2.0
55	7/29/19		1.0	1.0	2.0
Increase to 14-day interval					
69	8/12/19		1.0	1.0	2.0
83	8/26/19		1.0	1.0	2.0
97	9/9/19		1.0	1.0	2.0
111	9/23/19		1.0	1.0	2.0

Figure 1. Allergy Injection Schedule for Sumatran Tiger Eko.

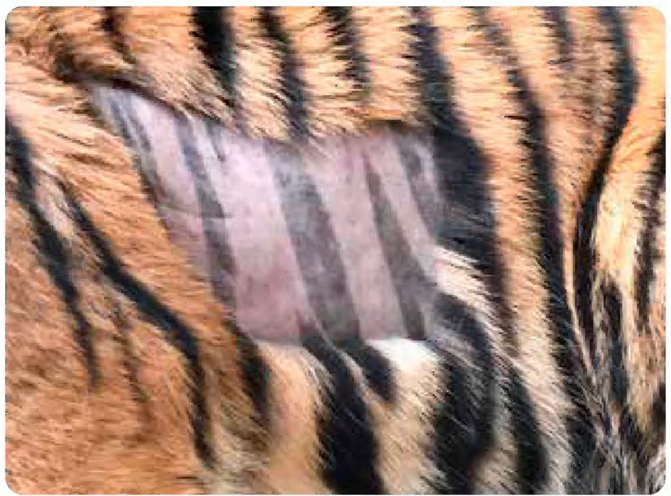
IMMOBILIZATION AND RESULTS

In February 2019, the Oklahoma City Zoo's (OKC Zoo) veterinary care team partnered with a board-certified Veterinary Dermatologist, Dr. Alicia Webb, [DVM, DACVD]. OKC Zoo's Veterinarian and Carnivore Team were able to immobilize Eko, and with Dr. Webb present, conduct an allergy panel test. The results of this test concluded that Eko was allergic to horse, cedar, and grass, three allergens that were very difficult for him to avoid. Felids at the OKC Zoo are fed Nebraska Feline Diet (horse meat), as well as several whole prey items throughout the week. Additionally, the OKC Zoo has two tiger habitats, with a primary substrate of grass through which the tigers are rotated regularly. When not out in one of two habitats, they are housed in indoor holding, which includes a dayroom with a large hanging cedar log for scratching, as well as other cedar logs that are moved around the different holding stalls for environmental enrichment. Based on the results, the veterinary dermatologist developed a custom allergy vaccine and injection schedule for Eko to lessen the symptoms of his allergies. Allergen injections are subcutaneous, meaning they are delivered right under the skin.

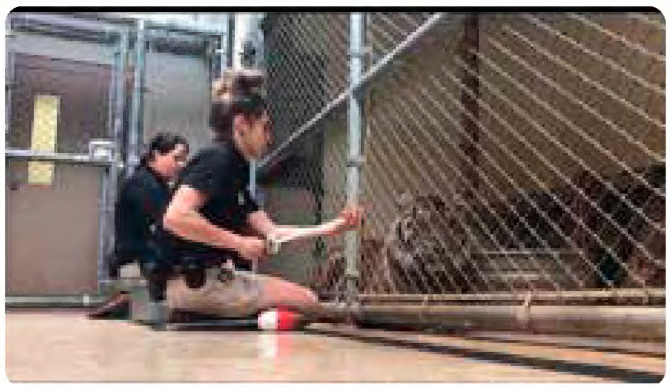
The timeline of the injections presented by the veterinary dermatologist did not allow any missed injections. Knowing this, we needed to be sure the behavior was solid before deciding to start offering injections. The schedule started by introducing mold and pollen, in small volumes in short intervals, eventually reaching a 2 ml injection. This schedule lasted two weeks with Eko receiving injections every other day. The schedule eventually increased to 10-day intervals and then to the long-term plan of 14-day intervals, which Eko would most likely require for the duration of his life. We graded his reaction to each injection on an itchiness scale to make sure he did not need supplemental medication to help relieve the itchiness.

TRAINING

With the need to give Eko subcutaneous injections, most likely for the rest of his life, the carnivore team was tasked with preparing Eko to accept these shots via operant conditioning. Eko knew some training basics, including target, up, and down; however, he was not yet trained to receive injections. We started getting him comfortable in a calm down position between a stock tank and the mesh for extended periods of time, a typical line



Allergy Panel Test Image. Photo by Mandi Townzen.



Line up position between mesh and stock tank. Eko with two carnivore caretakers. Photo by Mandi Townzen.

up position. Next, we worked towards desensitizing him to us touching his back hip, working our way through touching with a dowel, a blunt needle, and eventually a real needle. Fortunately, Eko was highly food motivated, however, we soon learned a couple things we would have to work through to get this behavior at the level needed for consistent, repetitive injections.

First, Eko was overly food motivated, to the point where he showed aggression during the training sessions. We opted to offer him at least half of his diet earlier in the day, prior to the training session, in order to help satiate him. We found the aggressive behaviors decreased, including charging the mesh, and his inability to lay calmly. Next, we decided to train the behavior with the two caretakers Eko was most comfortable around; with the goal of adding other caretakers into the behavior in the future. On the caretaker side, we needed to figure out the best way to tent the skin for a subcutaneous injection. With the goal of being as safe as possible, we would not use our fingers, and therefore began testing some tong options. We started with long metal tongs; however, they did not grab his skin well, and often slipped. Eventually, we were able to find a pair of short rubber tongs with ridged areas at the end, these ultimately gripped well, easily allowing us to tent the skin. We initially started training this behavior in April 2019, and we believed Eko was ready to receive his first real injection of allergy medications in June 2019 to start his treatment.

LONG-TERM

After starting Eko's treatment in June of 2019, he has received 45 injections without missing a single treatment, and voluntarily participated in every session. Our team was able to incorporate nearly every caretaker into this behavior. For a period of time, Eko was only receiving allergy injections, but caretakers eventually noticed him scratching his face on the mesh and broken skin/whiskers once again. The veterinary team decided to continue the allergy injections, but to include a daily prescription of cetirizine as well. The vet team believes that due to present allergens, Eko will require these injections throughout his life at the OKC Zoo. However, the hope is that Eko may not require injections as frequently since moving to Akron Zoo, further north, likely with fewer allergens.

CONCLUSION

This was the first carnivore at the OKC Zoo to need this kind of repetitive injection for allergy treatments. It is our hope that this information may help other facilities recognize that this treatment may be possible in a variety of situations, for a variety of species. The ability to hand-inject for this behavior makes this treatment possible, which drastically improved the welfare of this individual. Throughout this training process Eko's demeanor has relaxed and we have been able to use training techniques that worked for him and implement those with the other tigers in our care. Additionally, this behavior is not difficult to train or pass off to other staff. Caretakers at Eko's receiving facility will easily be able to maintain this behavior with minimal effort after establishing a positive relationship with him.

Miller, A. 2002. Catch a Tiger by the Tail: Tiger Training at Disney's Animal Kingdom®. *Animal Keepers' Forum* 29(7):299-303.
Miller A. 2012. Catch a Tiger by the Tail: The Next Phase of Tiger Training at Disney's Animal Kingdom®. *Animal Keepers' Forum.* 39(2):90-94.

TRAINING TALES EDITORIAL

Angela Binney,
Training Tales Co-Editor

This Training Tale demonstrates the immeasurable benefits of applying operant conditioning to problem solving to address not just a specific need, but for general enhanced care and welfare. In addition to offering logistically feasible, safe treatment for an allergy prone tiger, this accomplishment opens up a whole host of opportunities! Once a care team experiences this type of success, their husbandry program can truly blossom, gaining team skill and confidence and evolving into a comprehensive training and care regimen. The hard work and dedication pays off by simplifying care and offering new treatment options, while reducing the need for anesthesia procedures. Suddenly, the ability to achieve voluntary participation in non-sedated medical care allows the team to efficiently provide exceptional care, monitor health and assess needs as presented, and administer expanded treatment options (See Miller, 2002 and 2012). Once a training team starts to brainstorm and test new ideas, the possibilities are nothing short of amazing! Congratulations to Mandi and Rachel and thank you for sharing your training tale with us!

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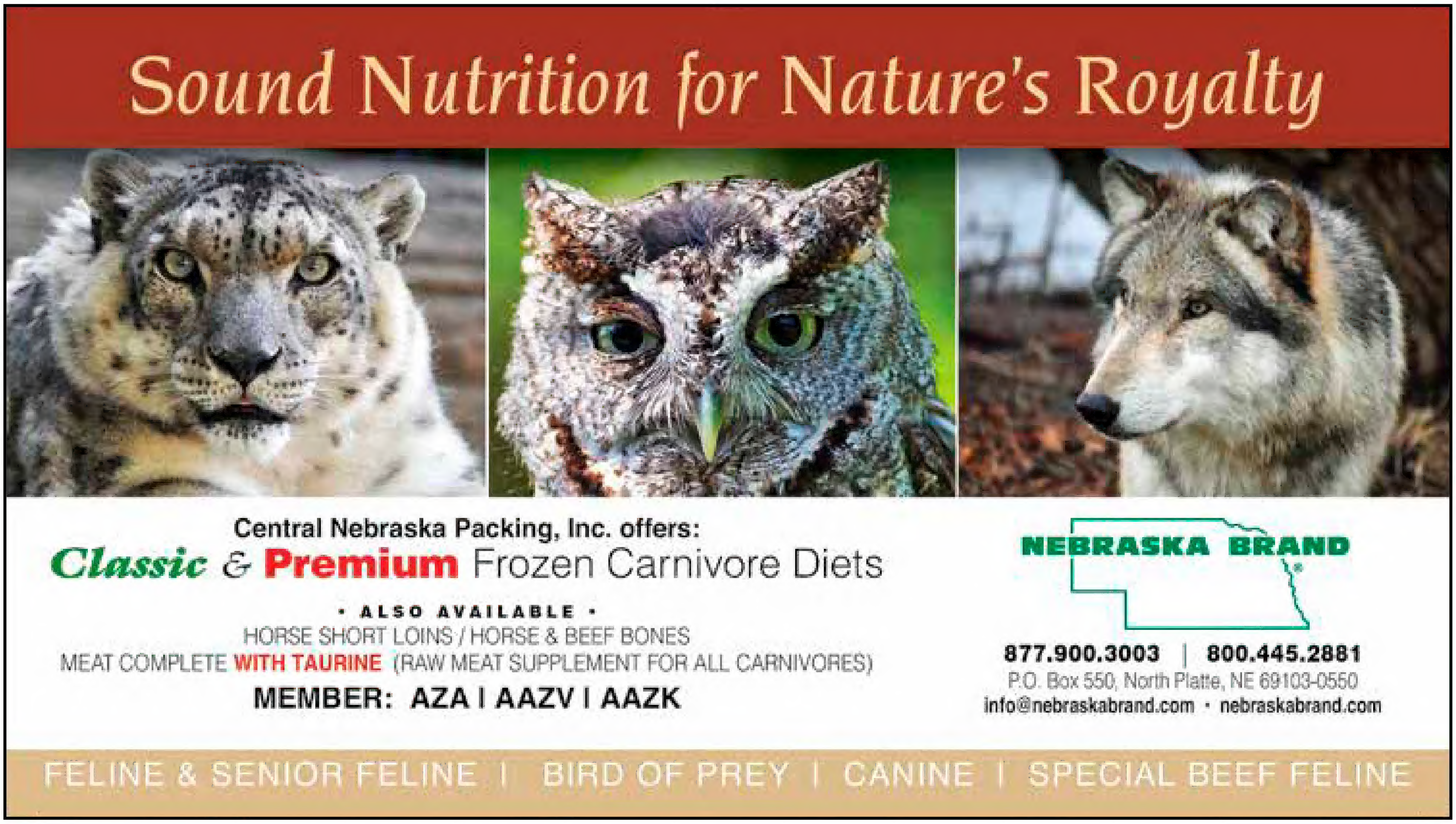

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